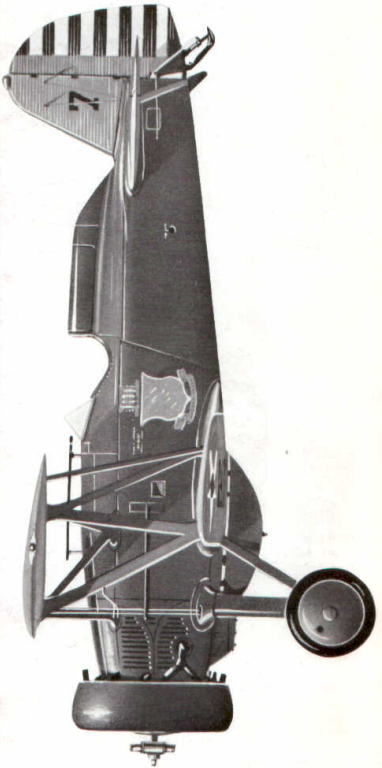
PROFILE
PUBLICATIONS

The Boeing P-12E



NUMBER 2
TWO SHILLINGS

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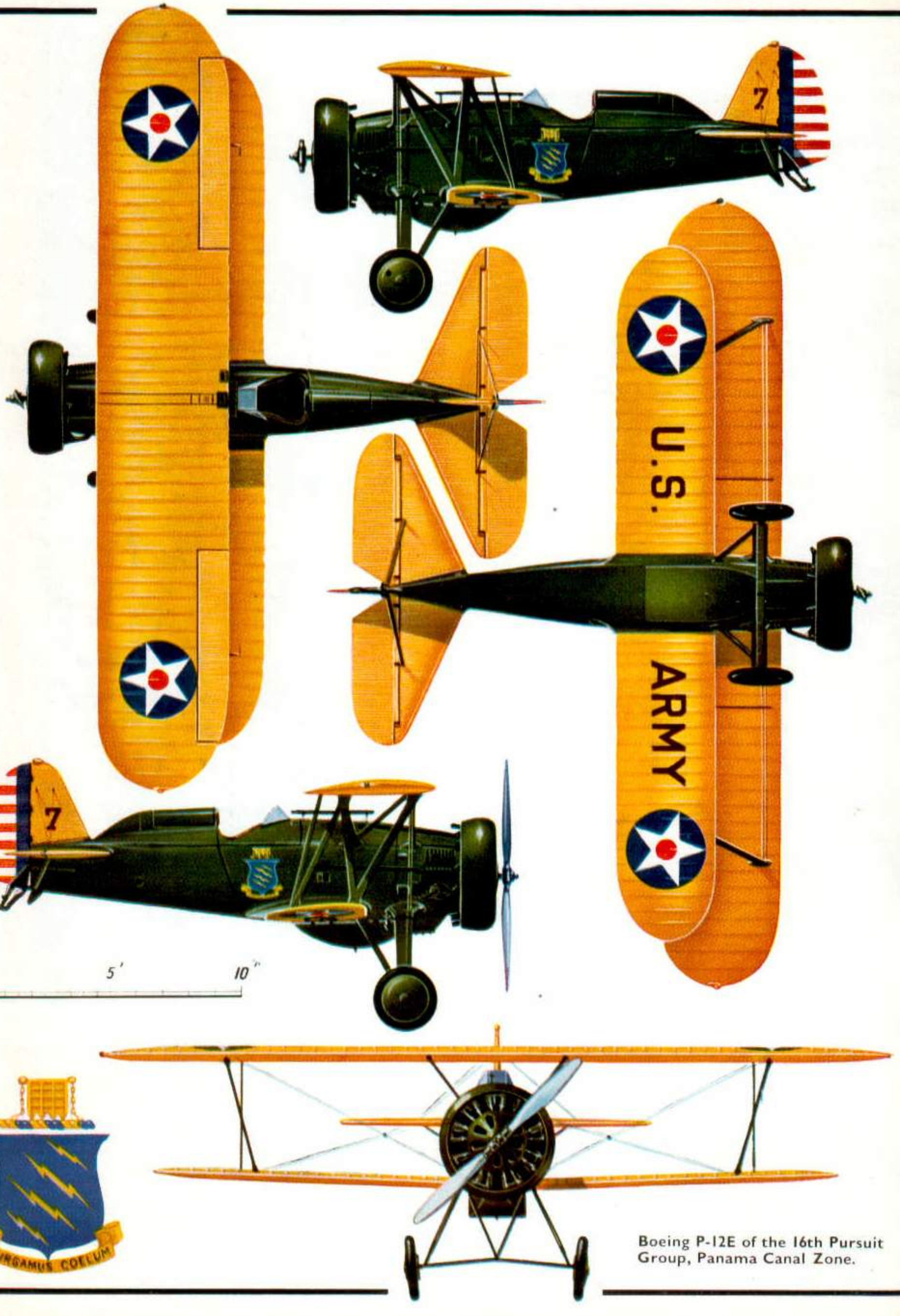


Boeing P-12E of the 16th Pursuit Group, Panama Canal Zone.

The Boeing P-12E

by Peter M. Bowers

A P-12E of the 27th Pursuit Squadron. See page 11 for colour details of squadron markings.

June 25th 1928 can be said to have opened the final chapter in the history of the biplane fighter in service with the U.S. Army, for on that day flew the Boeing Model 83, forerunner of the most successful family of fighters to serve with America's forces between the two World Wars.

The Model 83 was developed by the Boeing Airplane Company of Seattle at company expense in the hope of succeeding with a replacement for the Army's PW-9* and the Navy's F2B and F3B fighters in service towards the end of the 'twenties. The risk involved came to be justified, for no fewer than 586 aircraft in the F4B/P-12/100 series were built in the next half dozen years. They brought the era of the biplane fighter to an end for the Army, and were in service in secondary rôles until shortly after America's entry into World War II.

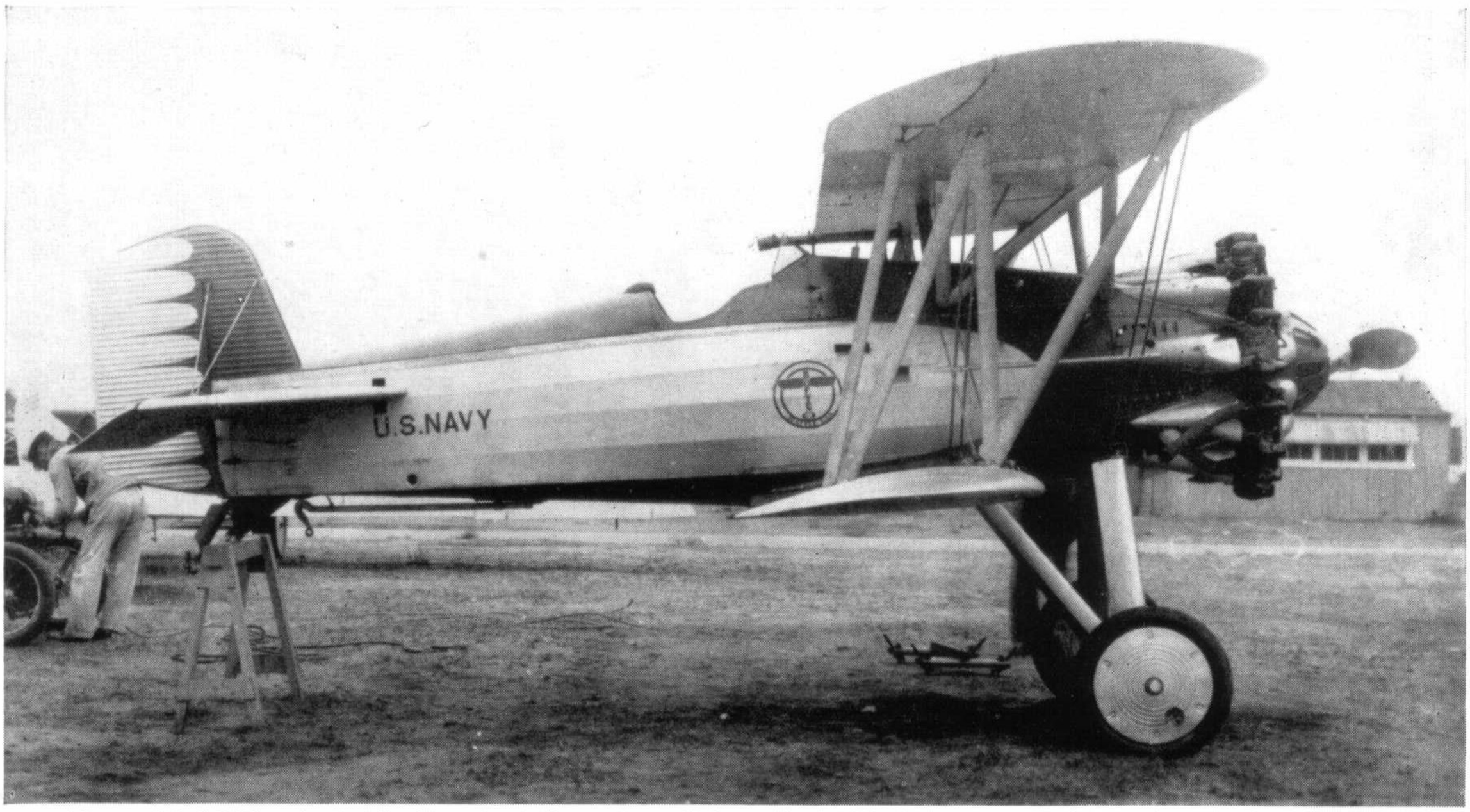
The relatively long production life of the basic model and the refinement of successive variants provide a perfect example of evolution in the art of aircraft design and demonstrates the full life cycle of an aircraft "family". Some of the changes made to the basic design were the result of experience with earlier models, and some were "retro-fit" installations where the components of late models were used on early aircraft to bring them up to date. Some of these changes were initiated by Boeing or the Services to improve the efficiency of the design as a fighting aircraft. Others, especially some made by the Army Air Corps, were merely for the purpose of developing or testing powerplant or equipment for general aircraft application. In such cases the aeroplanes were frequently given experimental designations and a new series letter to indicate their change from standard fighter status. This also protected the test programme from time losses incurred by mandatory compliance with maintenance bulletins that were issued periodically for most standard service aircraft.

* Between 1920 and 1924 the Army used a designation system of prefixes PA, PW and PN (pursuit, air-cooled; pursuit, water-cooled and pursuit, night, respectively); subsequently the familiar "plain" P-Pursuit nomenclature was adopted.

THE DESIGN DESCRIBED

The fuselage structure of the Model 83 was interesting in that it introduced bolted-up aluminium tubing construction. (An exactly parallel development was taking place in Britain in the evolution of the Hawker Fury—designed to replace the welded-steel Bristol Bulldog.) The fuselage of the Model 83 and early production aircraft retained welded steel tubing in the engine mounting and centre-section area, but bolted square dural tubing was used aft of the cockpit. Bolted instead of welded joints had been used in fuselage designs previously, the steel tubes being, however, bolted to tabs welded to the longerons. On the 83, the tubes were bolted directly to one another through dural gussets.

Wing design differed from previous Boeing practice in the use of straight instead of tapered planform. Construction remained unaltered—two box spars with spruce flanges and mahogany ply web. The ribs were band-sawed from mahogany ply and fitted with spruce strips. The upper wing was built up in one piece but the two lower wings, although constructed separately, were bolted together at the spar butts for installation as a single unit. The aerofoil section was the newly-developed Boeing 106 section. The entire tail unit was of semi-monocoque metal construction using the integrally stiff corrugated skinning developed for the Boeing F3B-1.



Above: *Model 83 under test by Navy in civilian colours.* Below: *Model 89, 2nd prototype of the series, also in civil colours.*

Armament consisted of either two 0·30-cal. Browning guns (with 600 rounds per gun) or one 0·30 and one 0·50-cal. gun (with 600 rounds for the smaller gun and 200 for the larger). The guns were situated in the top of the nose, with troughs in the panelling and synchronised to fire through the propeller arc. The Pratt & Whitney R-1340-7* power-plant developed 450-h.p. at 5,000 feet in early production machines, and used a ground adjustable variable-pitch two-blade metal propeller. A 55-U.S. gallon auxiliary fuel tank could be fitted between the undercarriage legs as optional equipment. Bomb-loads of up to about 700 pounds could be distributed under the lower wing and fuselage belly.

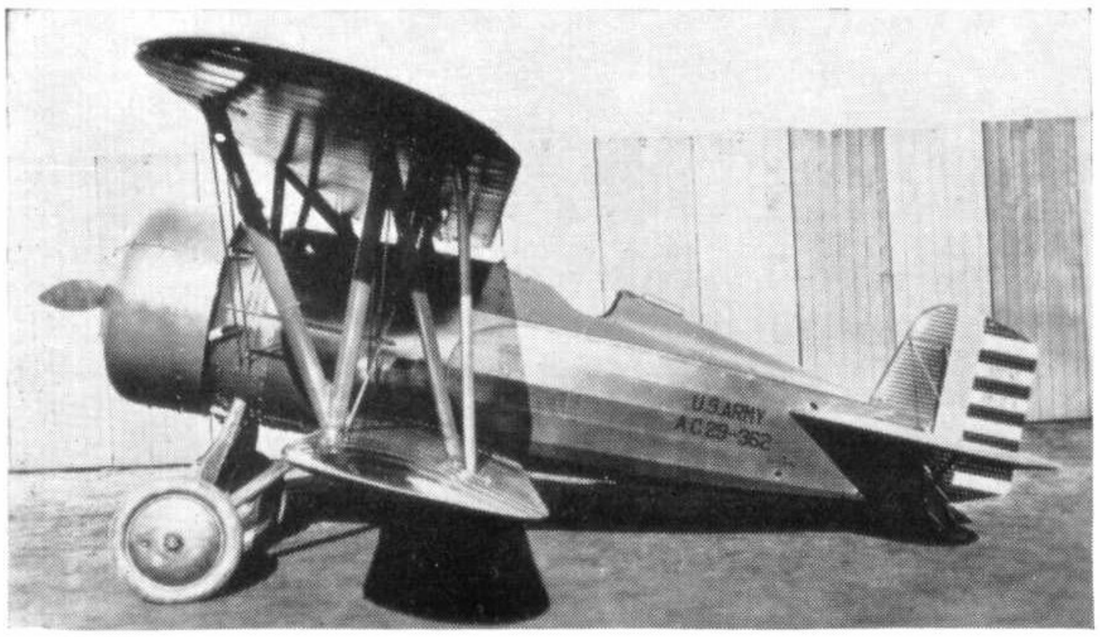
THE MODEL 83 AND 89 PROTOTYPES

Boeings produced two prototypes which, in effect, sired the entire P-12/F4B range. The first, the Model 83, was first flown at Seattle on June 25th 1928 and was delivered three days later to San Diego for

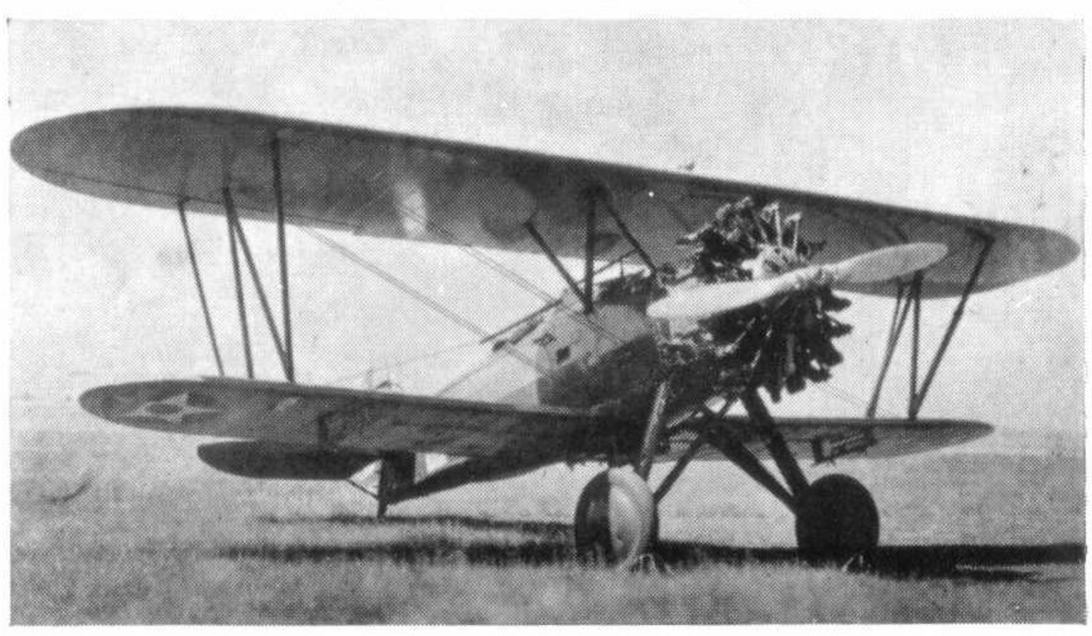
detailed evaluation. The Model 89 was completed the following month and transported by rail to the Navy Test Center at Anacostia, Maryland, on July 24th, flying for the first time on August 7th. The two aircraft differed in that the 83 had a spreader-bar undercarriage with diagonal strut bracing to the middle of the bar, whereas the 89 had split-axle gear. The later aircraft was equipped with a 500-lb. bomb rack between the undercarriage legs, while the 83 was fitted with an arrester hook. Colour schemes were identical, French grey predominating; Boeing green trim

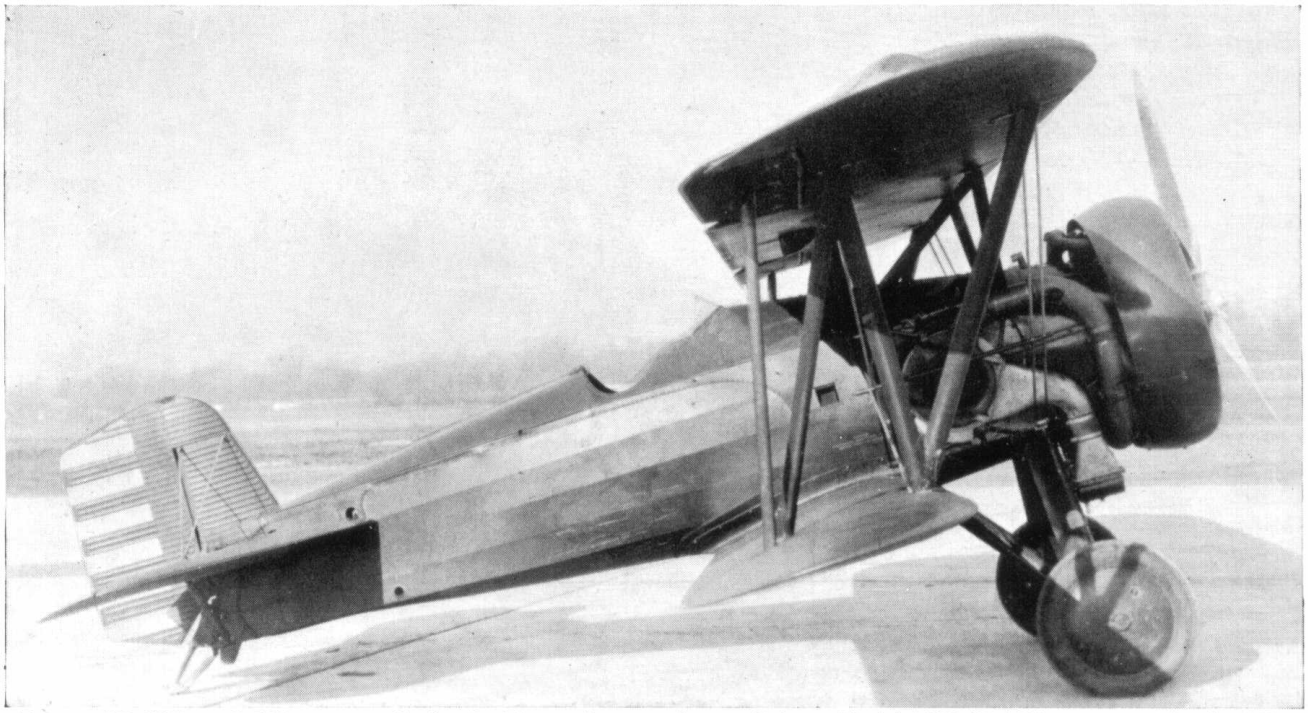
* The engine designation denoted a radial engine with a displacement of 1340 cubic inches. The previous equivalent designation, SR-1340C, denoted a supercharged radial, the C indicating the third basic variant. This became the R-1340-7 in the new system of allocating even dash numbers for Navy, and odd dash numbers for Army engines.

Model 101 diverted from Army P-12 contract and completed as experimental XP-12A. Note full cowling and shortened landing gear.

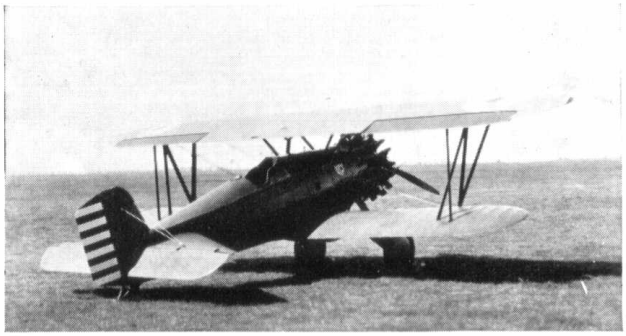


Model 102, standard Army P-12, duplicate of Navy F4B-1 except for deletion of naval gear.





Above: *XP-12G, a P-12B temporarily fitted with a turbo-supercharger.* Below: *Model 102B (P-12B) using straight-chord Frise ailerons of XP-12A but retaining the divided landing gear of F4B-1 and P-12.*



appeared on the fuselage and tail, and the top surfaces of the upper wings were orange. Since both aircraft were Boeing-owned, neither bore military markings—nor, strangely, did they carry the civil registrations allocated to them. Although not Navy property, they were referred to as XF4B-1s administratively and, while at San Diego, the 83 carried the markings "U.S. Navy" on the aft fuselage.

Both aircraft were originally powered by "long-nosed" R-1340B engines which were supposed to improve the aerodynamic shape of the nose. They were however soon replaced by the standard C (or dash-7) engines with no more than marginal effect on the performance.

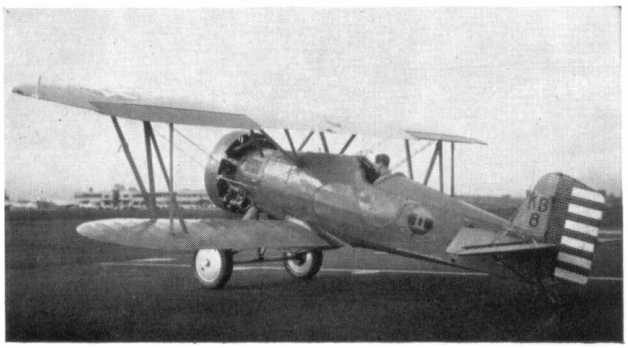
THE P-12 IS ORDERED

The path of the Model 83/89 now divides, for, while the Navy had first acquired the two prototypes for evaluation, the Army now also took an active interest in the development. While at Anacostia, the Model 89 was loaned to and tested by Army pilots at Bolling Field (the Army installation across the field from the Navy facility).

As the result of the Bolling pilots' reports on the Model 89, Boeing received a contract for ten P-12s on November 7th 1928, the first nine being similar to the naval version except for the deletion of the arrester hook and other purely naval equipment. The first P-12 completed was handed over to Air Corps Captain Ira C. Eaker on February 26th 1929 for a good-will speed flight to Central America. Named "Pan American", this P-12 was otherwise devoid of military markings, but was later returned to standard Army finish. The first flight by a standard P-12 was on

Model 218 with P-12B wings and empennage fitted to all-metal semi-monocoque fuselage. Was prototype for Army P-12E and Navy F4B-3. Fin shape was changed eventually.

Model 222, Army P-12C. Only difference from the P-12B is cross-axle landing gear and ring engine cowling.



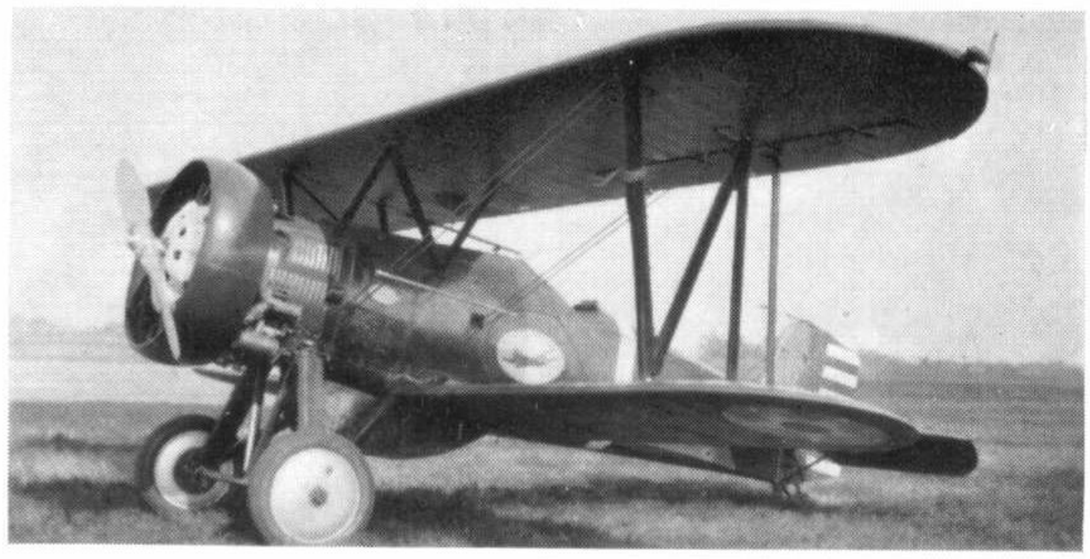
April 11th 1929, although others were in process of surface shipment to the Army, the last of the nine being delivered on April 26th. (Colouring was standard Air Corps olive drab on fuselage, struts and wheels, with chrome yellow on wings and tail.)

The basic P-12 was the only model in the Army series to use the tapered ailerons, these being the only external features to distinguish it from the later P-12B. P-12s were also delivered with fairings aft of the engine cylinders, but cooling problems led to their removal soon afterwards.

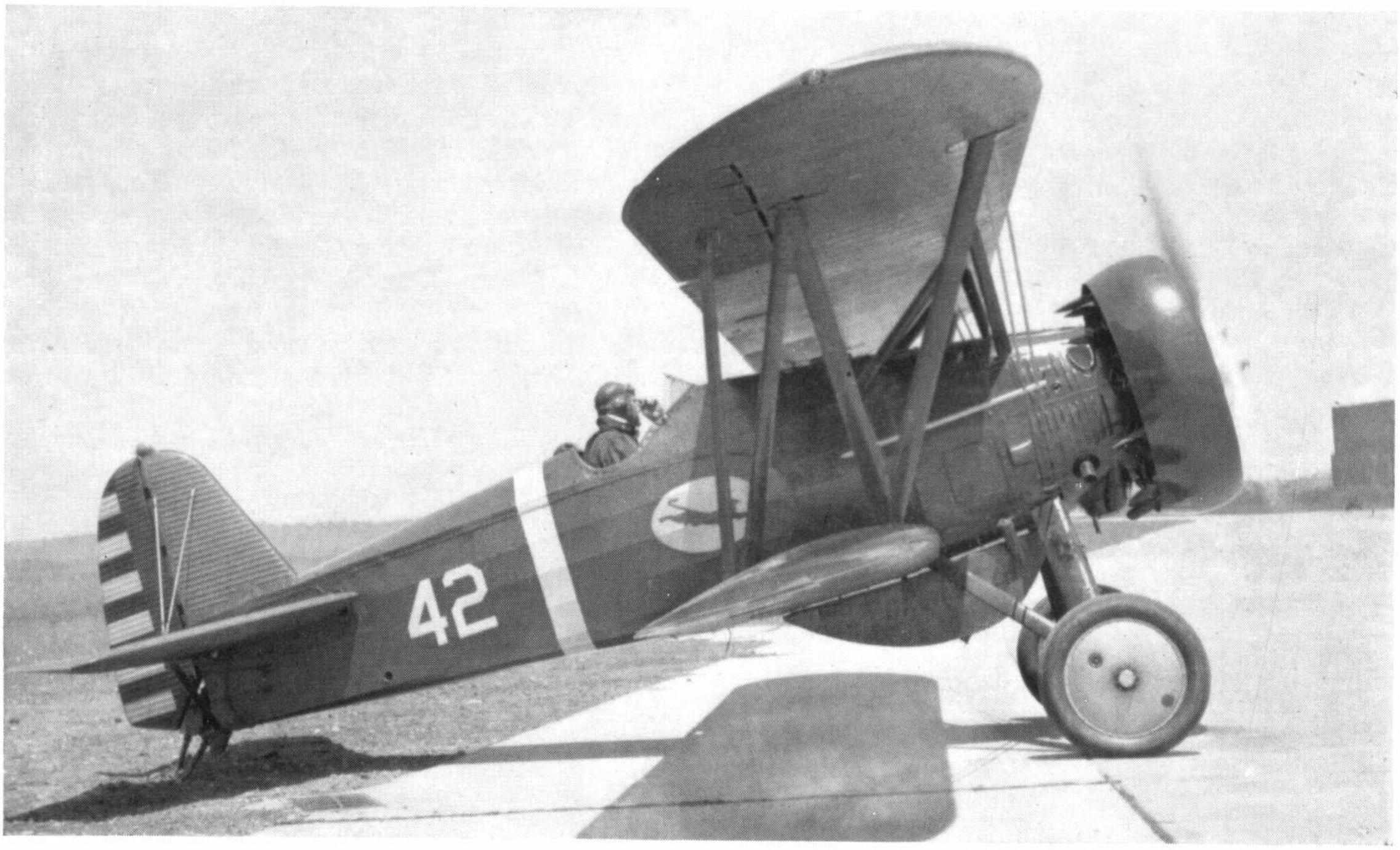
Following on the first nine P-12s (*29-353* to *-361*), the tenth and final aircraft on the first Army order, (*29-362*), was the XP-12A. This, the Boeing Model 101, incorporated various refinements suggested by the Army pilots and thus was regarded as the P-12 prototype proper. The differences included Frise ailerons with hinge line parallel to the wing spar, shorter undercarriage, long-chord Boeing engine cowling, redesigned elevators and a castoring tail-skid. Full armament provision was made, together with racks for five 25-lb. bombs. First flight by the XP-12A took place on April 11th 1929, but unfortunately little evaluation of the new features could be made as, with only four flying hours behind it, it was destroyed in a mid-air collision with another P-12 at Wright Field on May 18th.

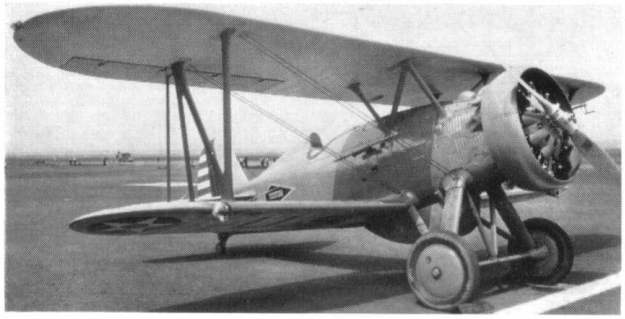
Nevertheless, evaluation of the remaining P-12s sufficed to eliminate some minor snags and on June 10th 1929 Boeing received an order for 90 P-12Bs—the largest single order placed by the Army in peace-time thus far.

The P-12B could be distinguished outwardly from the P-12 by the Frise ailerons and revised elevators of the XP-12, and the use of slightly larger 30 × 5-inch wheels instead of the earlier 28 × 4-inch version.



Top to bottom: *Model 227, Army P-12D, outwardly indistinguishable from P-12C; XP-12H, a P-12D fitted with an experimental improved version of the standard Pratt & Whitney Wasp; Model 234, P-12E with pilot's headrest modified to hold liferaft.* Below: *P-12D fitted with vertical tail surfaces of later P-12E.*





Top to bottom: *YP-12K, a standard P-12E fitted with fuel injection engine for evaluation; P-12E restored to pre-war condition in 1961. Note hand-painted registration number; same aircraft, originally of 27th Pursuit Sqdn., painted as Navy F4B-3 for Navy exhibition.* Below: *P-12Es of the 27th Pursuit Sqdn.* *See page 11 for colour scheme.*

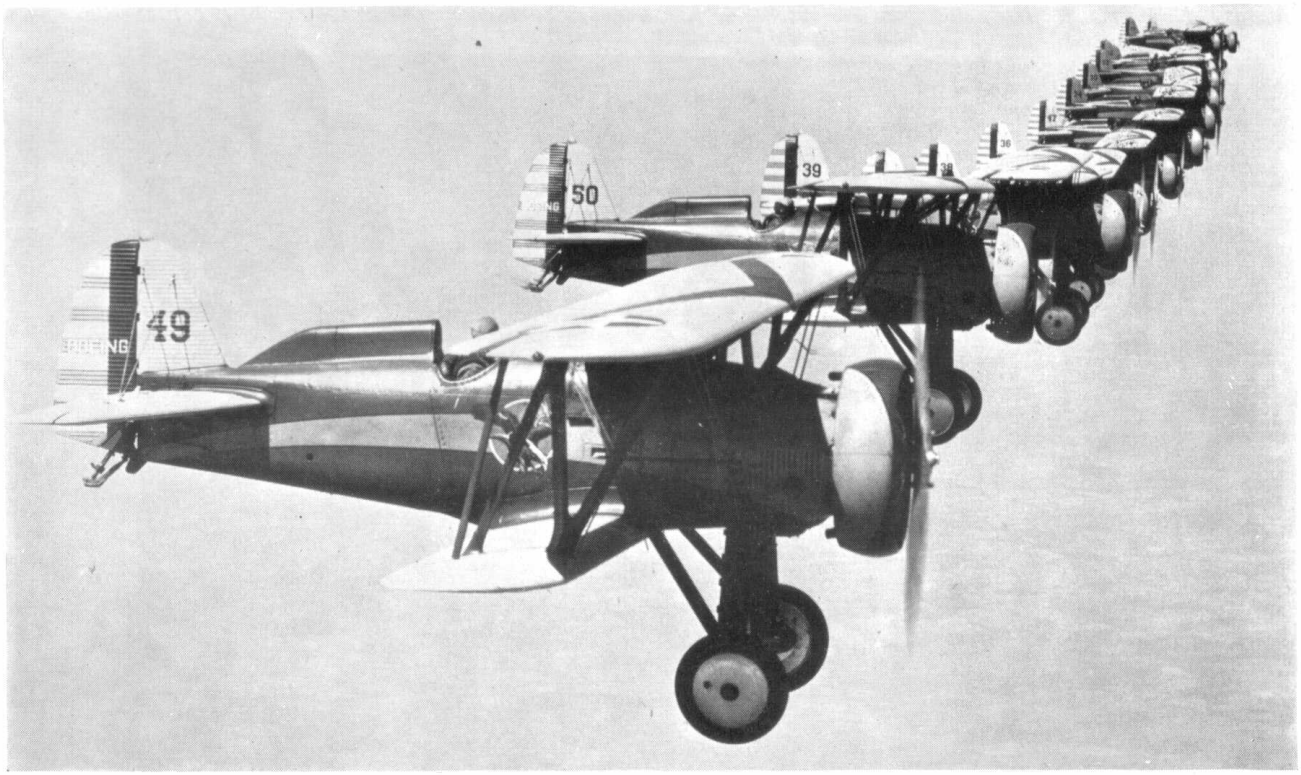
The landing gear and uncowled engine were the same as on the P-12 (omitting the cylinder fairings), but later on some P-12Bs were retro-fitted with ring cowlings developed for subsequent variants.

Cost of the P-12B was $11,224 each, less engine and Government Furnished Equipment (GFE). First of the batch (*29-329* to *-341*; *29-433* to *-450*; *30-29* to *-87*) was flown on May 30th 1930, and the last was delivered on May 17th—rail delivery of dismantled airframes having started on February 1st 1930.

The first aircraft of this batch (*29-329*) was later converted by the Army (under the designation XP-12G) for installation of the experimental Y1SR-1340G and H engines equipped with turbo-superchargers and ring cowlings of the type later adopted by the P-12C. Afterwards the aeroplane was returned to P-12B standard.

Next Army order was for the P-12C (Boeing Model 222), 136 of which were ordered on June 2nd 1930. In the event, only the first 96 (*31-147* to *-242*) were completed as P-12Cs, 35 of the remainder appearing as P-12Ds. The most obvious differences which identified the P-12C were the addition of an engine ring cowl and a spreader-bar undercarriage similar to that of the original Model 83. Performance bestowed by the R-1340-9 (or SR-1340D), which was rated at 450-h.p. at 8,000 feet, included a top speed of 175·5 m.p.h. at 10,000 feet and 176·5 m.p.h. at sea level. Amortisation had reduced the unit cost of the P-12C to $10,644 less engine and GFE. Delivery of dismantled aircraft to the Army commenced on August 30th 1930 and was completed on February 12th 1931, and the first recorded flight was on January 30th that year.

The P-12D (Boeing Model 227) followed the P-12C deliveries without interruption, beginning on February 25th 1931 and ending on April 28th, the first flight



taking place on March 2nd. These thirty-five aircraft (*31-243* to *-277*) differed only internally from the P-12C—it being a common but mistaken belief that alterations to the engine cowling distinguished the two. In fact the engine cowlings were interchangeable.

The thirty-third P-12D was modified as the XP-12H by the Army to accommodate an experimental Pratt & Whitney GISR-1340E geared radial engine. Tests on *31-275* indicated that the arrangement was unsatisfactory and the aircraft was returned to P-12D standard in June 1932.

THE P-12E SERIES

On September 29th 1930 Boeing first flew its private-venture Model 218. This was initiated as a company-owned aircraft to develop new features for the P-12/F4B series, and was essentially a P-12B with semi-monocoque metal fuselage structure. As such, it came to be considered as the prototype of the P-12E and F4B-3, and was tested by both Army and Navy pilots under Bailment Contract.

Early in the test programme on the Model 218 (X66W), the vertical tail surfaces underwent modification, the change being perpetuated in subsequent production variants. Later on, the R-1340D engine was replaced temporarily by an R-1340E, but the standard engine, rated for maximum power at 8,000 feet, produced a top speed of 195 m.p.h. at that height.

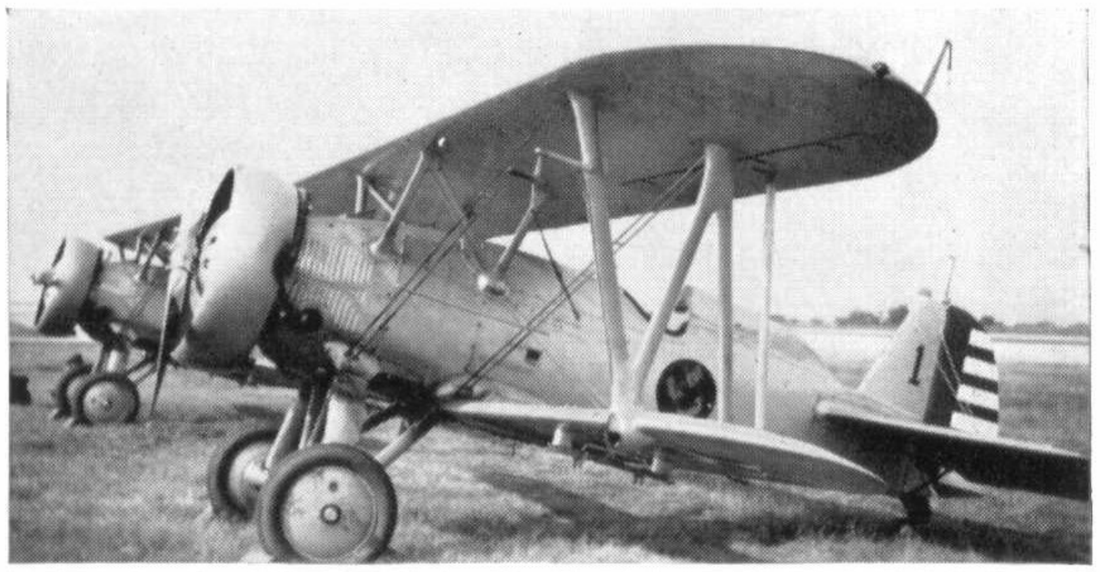
After completion of testing, the sole Model 218 was sold to China and, flown by an American volunteer pilot, Robert Short, destroyed two out of three attacking Japanese fighters before being shot down over Shanghai in 1932.

The considerable promise shown by the Model 218, not least performance-wise, prompted the Army to order the type into production and, with the Boeing designation Model 234, appeared as the P-12E—the most widely used and long-lived of the Army series. 135 P-12Es were ordered on March 3rd 1931, and 110 (*31-553* to *-586*; *32-1* to *-76*) were delivered as such between September 19th and October 15th the same year. The remaining 25 were completed as P-12Fs. The first flight by a P-12E took place on October 15th 1931.

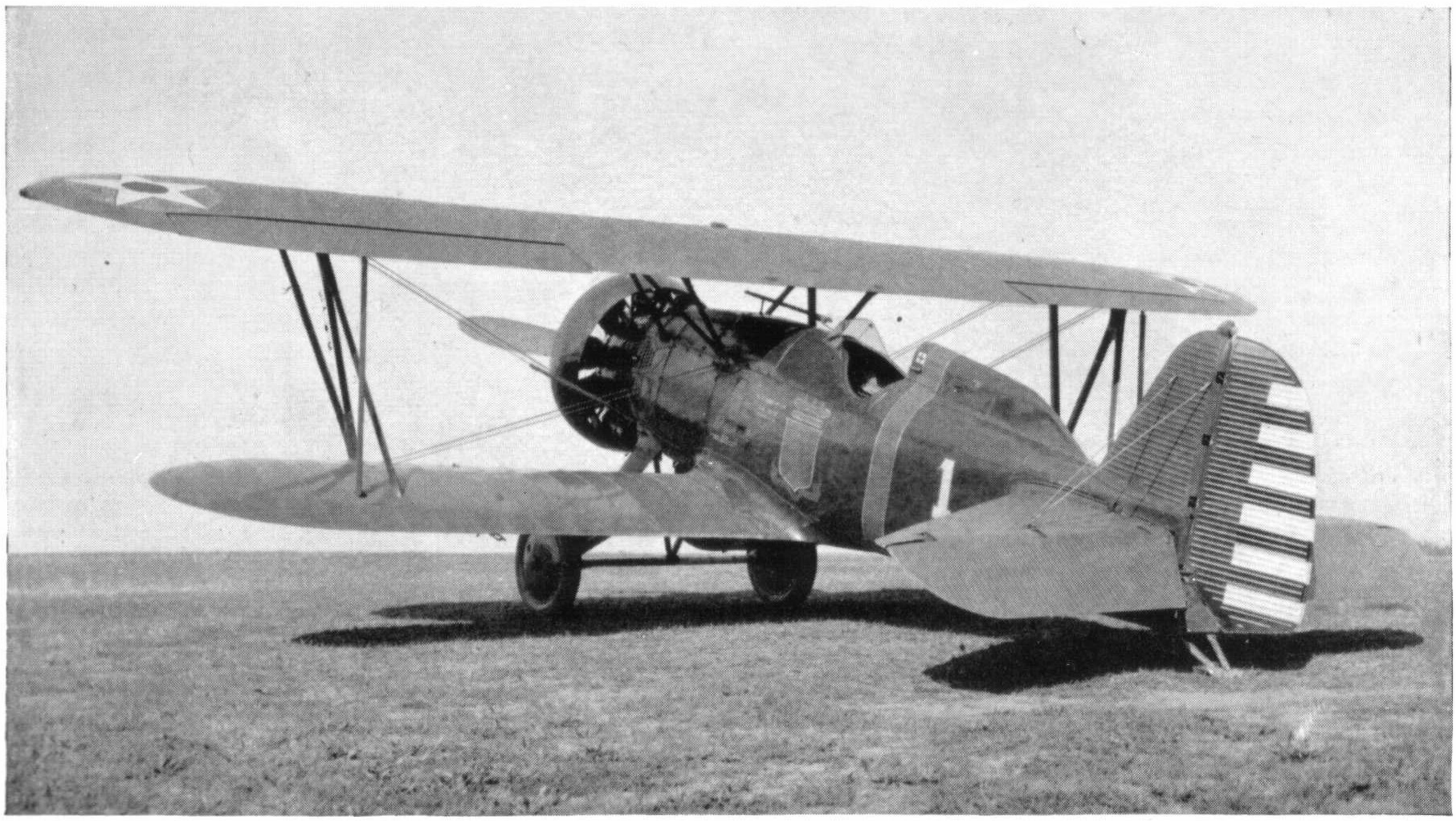
As originally delivered, P-12Es were painted in the standard Army olive drab on fuselages, with yellow wings and tails. The fuselages were later repainted in Air Corps (pale) blue, and in 1940 the entire aircraft was painted silver—resulting from an Air Corps directive calling for all obsolescent tactical types having painted surfaces to be repainted in this colour.

The basic P-12E underwent many changes of designation after entering service, not always denoting changes in appearance or equipment. For instance, the first P-12E, *31-553*, was re-designated XP-12E on October 1st 1931 immediately after delivery; this was simply to identify a standard example of the E-series withdrawn from service for test work. Later on it resumed its P-12E title.

P-12E *32-42* became the P-12J with the installation of a Pratt & Whitney SR-1340H engine, rated at 575-h.p. at 2,500 feet, and a special bombsight at Wright Field. This machine became one of the seven



Above: *P-12E in the all-silver finish applied to obsolete fabric-covered and painted aircraft in 1940.* Below: *P-12E of 8th Pursuit Group—Group Commanders aircraft. 550 h.p. Wasp.*



YP-12Ks after yet another engine change.

The XP-12E, the P-12J and five standard P-12Es (*32-33*, *-36*, *-40*, *-46* and *-49*) became YP-12Ks when SR-1340E engines with fuel injection were installed for service trials. All reverted to P-12E standard in June 1938.

A further complication arose when the YP-12K, *31-553* (ex XP-12E), was redesignated XP-12L on January 2nd 1934, being fitted with a Type F-7 turbo-supercharger. It reverted to YP-12K in February 1937, and to P-12E in June 1938 with the other examples.

One P-12E was to have been equipped with radio controls in 1940 and tested as an unmanned target aircraft; however, the Army abandoned the proposal to use obsolete service models for this purpose and the scheme, designated A-5, did not materialise.

Nevertheless, while most P-12Es and Fs were grounded and assigned to Air Corps and contract mechanics' schools in 1941, twenty-three miscellaneous P-12s were handed over to the Navy for use as radio-controlled target aircraft on the A-5 pattern.

Although bearing different Army designations, all these P-12s* were referred to by the Navy as F4B-4As —the A denoting their former Army status.

* P-12C: *31-151*, *-154*, *-209*, *-210*; P-12D: *31-245*, *-258*; P-12E: *31-561*, *-564*, *-576*; *32-10*, *-13*, *-25*, *-33*, *-40*, *-41*, *-44*, *-46*, *-48*, *-57*, *-66*, *-69*, *-71* P-12F: *32-85*.

One of the obsolete P-12Es (*32-17*) given to civilian schools in 1940-41 as non-flying classroom equipment, was obtained by the Ontario Air Museum, California, from the California Polytechnic Institute. It was slowly restored to display condition and had been made airworthy by 1961 under the civil registration *N3360G*. Repainted as an F4B-3, it participated in Navy celebrations of Armed Forces Day the same year. In 1962 it was restored to its correct Army configuration as a P-12E.

THE FINAL PRODUCTION VARIANT

The last 25 aircraft in the original P-12E (Model 234) order were completed as P-12Fs (Model 251). The initial difference was the installation of an SR-1340G engine, so rated as to deliver 500 h.p. at 11,000 feet instead of the 7,000 feet for the SR-1340E in the P-12E. The last ten P-12Fs were the first P-12s delivered with tailwheels, although the earlier F's and all the E's later had tailwheels by retro-fit.

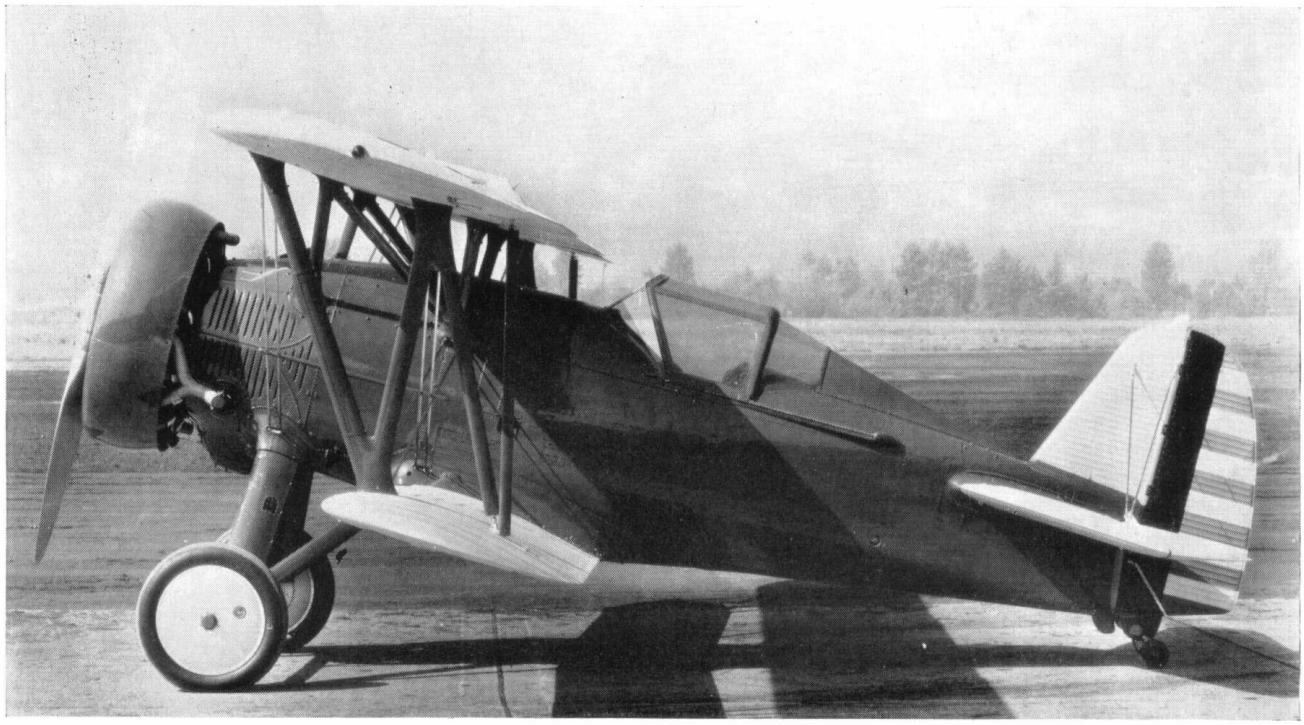
Last example of the P-12F batch (*32-77* to *-101*) gave foretaste of future cockpits in having a factory-fitted sliding canopy. This was the last P-12 built (deliveries of the P-12Fs taking place between March 6th and May 17th 1932), all Army designations in the P-12 series higher than F being conversions of earlier models.

CIVIL AND COMMERCIAL VARIANTS

Commencing in 1929 Boeing produced four commercial and export variants of the Model 100 with an affinity to both the Army P-12 and Navy F4B-1. The principal differences were the deletion of standard U.S. military equipment and the installation of the fuel tank in the centre-section of the upper wing.

The first Model 100 flew on October 8th 1929 and was sold to the Bureau of Air Commerce (now the

Above: *The last P-12F fitted with an experimental closed canopy.* Below: *A second P-12F, also with closed canopy, but with clear side panels.*



Model 100, the commercial counterpart of the F4B-1/P-12.

FAA) with the Government aircraft registration *NS-21*.

The second, *NX872H*, was sold to Pratt & Whitney for use as an engine test bed; apart from the original R-1340 "Wasp", this aeroplane also flew the R-98S "Wasp Junior", the R-1535 "Twin Wasp Junior" and the R-1690 "Hornet' 'engines. It was then sold to stunt pilot Milo Burcham who used it for display flying between 1933 and 1941 as *NC-872H* with distinctive modifications. The space between the undercarriage legs was faired-in, low-pressure tyres fitted, and metal panelling replacing the fuselage fabric. At the time of writing (1964) the aeroplane is currently owned by Paul Mantz of Santa Ana, California.

The third Model 100 has had the most varied career and has carried every possible combination of U.S. civil registration, commencing with the plain *873H* and passing through *C*, *NC*, *NR*, *NX* to *N873H*. It was used at the factory for several years as a test machine and demonstrator, and was then sent to the Boeing School of Aeronautics at Oakland, California, for use as an advanced trainer. It was acquired about 1936 by Paul Mantz for display and movie flying and is still being used for such. It is now powered by a war-surplus Wasp Junior driving a controllable-pitch propeller.

Last of the Model 100s, *NX874H*, was also used as a company demonstrator and was eventually sold to the Mitsui Company of Japan.

The Model 100A was a special convertible two-seat version of the basic Model 100 built to the special

Model 100D, the fourth standard machine, used to demonstrate improved features.

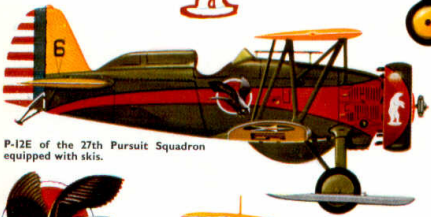
Above: **P-12E of the 77th Pursuit Squadron, 20th Pursuit Group.**

Above, left: **77th Pursuit Squadron.**
Right: **20th Pursuit Group.**

Right: **P-12E of the 79th Pursuit Squadron, 20th Pursuit Group.**

Below: **P-12E of the 95th Attack Squadron. Sqdn. Commanders a/c, 17th Attack Group.**

Above: **79th Pursuit Squadron.**
Right: **Polar Bear emblem.**

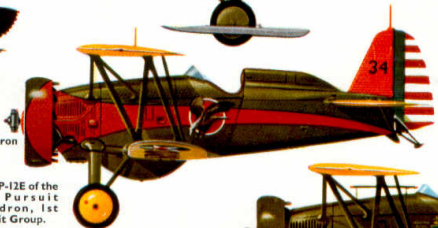


P-12E of the 27th Pursuit Squadron equipped with skis.

95th Attack Squadron.

17th Attack Group.

27th Pursuit Squadron



8th Pursuit Group.

Right: **P-12E of the 27th Pursuit Squadron, 1st Pursuit Group.**

Right: **P-12E of the 8th Pursuit Group. Group Commanders aircraft.**

Left: **1st Pursuit Group**

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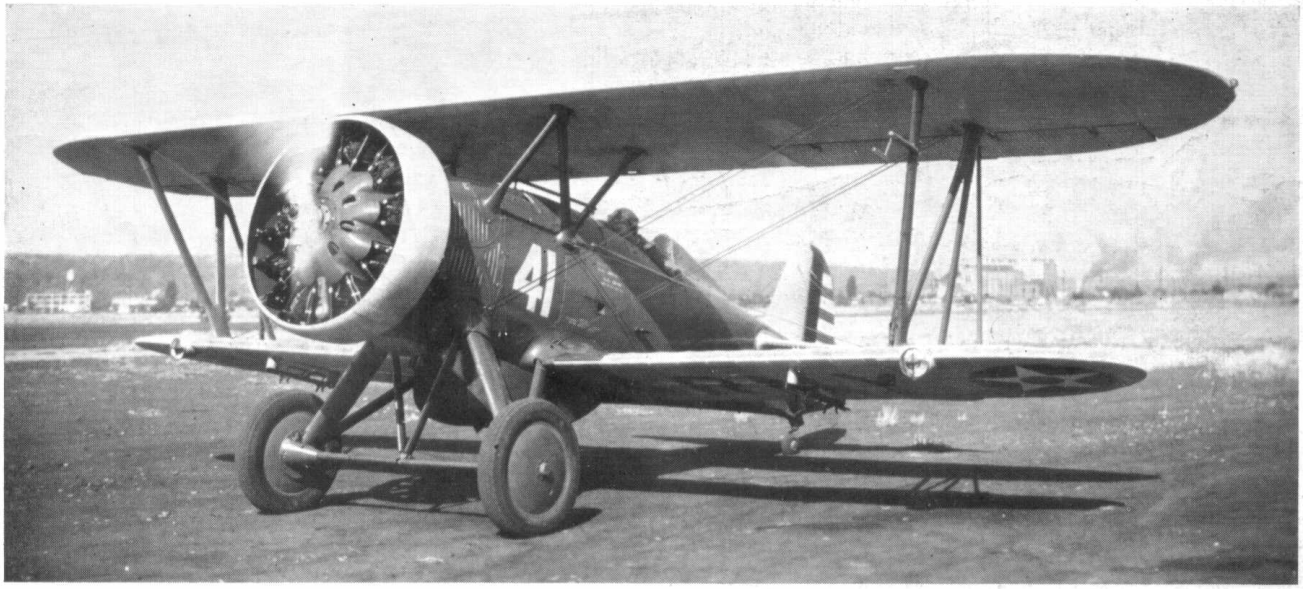

Model 251—P-12F.

order of Mr. Howard Hughes. Hughes undertook many extensive modifications before the aircraft was sold to Col. Arthur Goebel as a single seater. Registered *247K* it was destroyed in 1957.

Two Model 100Es were built for Siam (now Thailand) and were export versions of the P-12E. Owing to a ruling that export of aircraft currently in production for U.S. Forces could not be undertaken, the Boeing Model 234 designation was changed to 100E though general structure and performance was similar to that of the P-12E. Both 100Es were delivered in a dismantled state on November 10th 1931. The last surviving example (taken over by the Japanese during World War II), is currently preserved in the Thai Aeronautical Museum at Bankok.

The Model 100F was a one-off commercial equivalent of the P-12F delivered to Pratt & Whitney for engine testing. First engine fitted was the 700 h.p. R-1535 Twin Wasp Junior and with this was flown on June 20th 1932. So great was the diameter of the propeller used that both take-off and landing had to be performed in the "three-point" attitude to maintain ground clearance.

Like the Model 100, *NX872H*, the 100F also flew with the Hornet and Wasp engines. On one occasion it flew with each of the engines during the course of a single day as a demonstration of quick engine-changing techniques. Because of the different engine weights, the balance of the aeroplane was corrected during these engine changes by use of a sliding weight in the fuselage between the cockpit and tail. On a test flight the pilot lost consciousness due to a failure in the oxygen supply and the 100F fell into a spin. Not being designed to withstand the loads imposed by these gyrations, the weight broke loose and destroyed the flying controls—preventing recovery from the spin.

SPECIFICATION

	P-12	*P-12B*	*P-12C*	*P-12E*
Powerplant ...	450 h.p. Pratt & Whitney R-1340-7 (SR-1340C) rated at 5,000 ft.	450 h.p. Pratt & Whitney R-1340-7 (SR-1340C) rated at 5,000 ft.	450 h.p. Pratt & Whitney R-1340-9 (SR-1340D) rated at 8,000 ft.	500 h.p. Pratt & Whitney R-1340-17 (SR-1340E) rated at 7,000 ft.
Fuel Capacity	52–99 U.S. gal.	50–99 U.S. gal.	50–110 U.S. gal.	55–110 U.S. gal.
Dimensions				
Wing span ...	30 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.
Length ...	20 ft. 1 in.	20 ft. 3 in.	20 ft. 1 in.	20 ft. 3 in.
Height ...	9 ft. 7 in.	8 ft. 10 in.	8 ft. 8 in.	9 ft. 0 in.
Wing area ...	227·5 sq. ft.	227·5 sq. ft.	227·5 sq. ft.	227·5 sq. ft.
Weights				
Empty ...	1,758 lb.	1,945 lb.	1,938 lb.	1,999 lb.
Loaded ...	2,536 lb.	2,638 lb.	2,630 lb.	2,690 lb.
Performance				
Max. speed ...	171 m.p.h. at 5,000 ft.	175 m.p.h. at 5,000 ft.	178 m.p.h. at 8,000 ft.	189 m.p.h. at 7,000 ft.
Cruising speed	135 m.p.h.	137 m.p.h.	141 m.p.h.	160 m.p.h.
Initial climb ...	2,080 ft./min.	2,040 ft./min.	1,410 ft./min.	—
Combat ceiling	28,200 ft.	27,450 ft.	26,200 ft.	26,300 ft.
Range ...	520 miles	540 miles	580 miles	580 miles

Armament: Either two 0·30-cal. or one 0·30-cal. and one 0·50-cal. machine guns on nose. Racks for light bombs under wings and between undercarriage legs.

PRODUCTION

P-12: *29–353* to *–361* (9 aircraft). XP-12A: *29–362* (one aircraft). P-12B: *29–329* to *–341*; *29–433* to *–450*; *30–29* to *–87* (90 aircraft). P-12C: *31–147* to *–242* (96 aircraft). P-12D: *31–243* to *–277* (35 aircraft). P-12E: *31–553* to *–586*; *32–1* to *–76* (110 aircraft). P-12F: *32–77* to *–101* (25 aircraft). Total, 366 aircraft.

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